AP STAT: Ch. 8 part 2 review NAME: Key

Directions: Complete each problem. Don't forget assumptions and conclusions/interpretations!

1. The percent of AP students who take the AP exam is claimed to be 75%. Since the test has been getting more expensive each year, we think this percentage has gone down. We take a sample of 150 AP students and find that 95 are taking the AP exam for their class. Test the claim at the 4% level of significance.

$x = 95$

$n = 150$

$\alpha = 0.04$

$H_0: p = 0.75$

$H_a: p < 0.75$

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = -3.2998$$

$$P(z < -3.2998) = 4.84 \times 10^{-4}$$

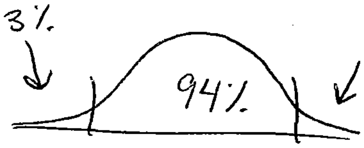
- reject
- $p < 0.75$

2. Find a 95% confidence interval for the percent of AP students who take the test. Interpret your interval.

$$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = (0.55622, 0.71045)$$

We are 95% conf. that...

3. What is the Z* for a 94% confidence interval? Show work.



$z^* = \text{invnorm}(.97, 0, 1) = 1.881$

4. What sample size would give us a margin of error of 6.5% with a confidence level of 94%?

$$0.065 = 1.881\sqrt{\frac{(0.5)(0.5)}{n}} \qquad n = 210$$

5. What sample size would give us a margin of error of 3% with a confidence level of 90% if we have a claimed value of 35% for our proportion?

$$0.03 = 1.645\sqrt{\frac{(0.35)(0.65)}{n}} \qquad n = 685$$

6. I take a sample of 240 people and find that 60 of them answer yes to my survey. I have a confidence interval that goes from 0.19936 to 0.30064. What is my level of confidence?

$$\hat{p} = \frac{60}{240} = 0.25$$

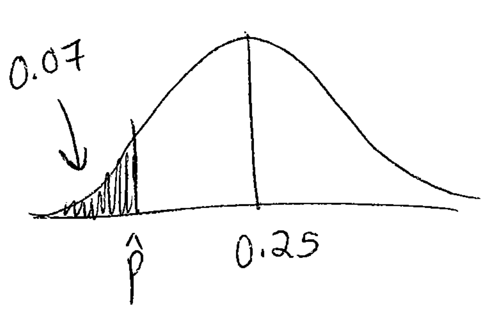
$$m = 0.05064 = z^*\sqrt{\frac{(0.25)(0.75)}{240}} \qquad z^* = 1.81175$$

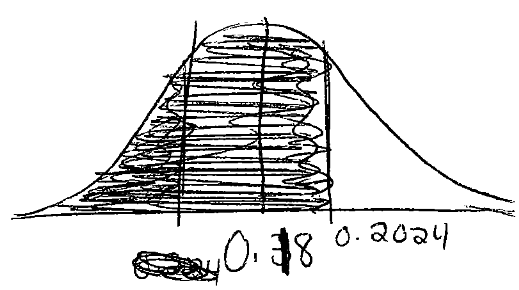
93%

7. Find the power of the following test, and types I and II errors. Is the test sufficiently sensitive to detect the change?

Ho: p = 0.25   n = 180 p_A = ~~0.08~~ 0.18

Ha: p < 0.25   alpha = 0.07





$$\hat{p} = \text{invnorm}\left(0.07, 0.25, \sqrt{\frac{(0.25)(0.75)}{180}}\right)$$

$$\hat{p} = 0.2024$$

$$P(\hat{p} < 0.2024 \mid p = 0.18) = 0.7562$$

Type I = 0.07

Type II = 0.2438

8. We are comparing the percentage of males and females that play at least one high school sport. We think that the percentages are different. We take a sample of 145 males and find that 95 of them play at least 1 HS sport. We take a sample of 120 females and find that 80 of them play at least 1 HS sport. Is there evidence that the proportion is different in the genders? Use a level of significance of 5%.

$\hat{p}_M = \frac{95}{145}$ $\hat{p}_F = \frac{80}{120}$ $\alpha = 0.05$

$H_0: p_M = p_F$

$H_a: p_M \neq p_F$

- fail to reject
- prop. are equa in 2 genders

$$z = \frac{\hat{p}_M - \hat{p}_F}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_M}+\frac{1}{n_F}\right)}} = -0.1966$$

$$2 \cdot P(z < -0.1966) = 0.844$$

9. Find a 92% confidence interval for the difference between the proportions of males and females that play at least 1 sport in high school. Interpret the interval. Also, based on this interval, do you think there is a difference between the genders?

$$(\hat{p}_M - \hat{p}_F) \pm z^* \sqrt{\frac{\hat{p}_m(1-\hat{p}_m)}{n_m} + \frac{\hat{p}_F(1-\hat{p}_F)}{n_F}}$$

$$= (-0.1137, 0.09074)$$

We are 92% conf. that the diff. btw. the prop. of male + females who play one sport is btw...

Since 0 is in the interval and $0 = \hat{p}_1 - p_2$ means the 2 prop. are =, then there is no diff. btw. the 2 prop.

10. The proportion of people in the USA who celebrate Christmas was claimed to be 67% in 1990. We think that this proportion is different. We take a sample of 210 people and find that 125 celebrate Christmas. Using a confidence interval and a 0.07 level of significance, test the claim.

$H_0: p = 0.67$
$H_a: p \neq 0.67$

$\hat{p} = \frac{125}{210} = 0.595$

$\alpha = 0.07 \quad C.L. = 93\%$

$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = (0.53387, 0.65661)$

- reject b/c $p = 0.67$ is not in 93% conf int.

11. What does 95% confidence mean?

12. What is a p-value?

prob. of getting our sample or something more extreme if Ho is true

13. What should we take into account when deciding our significance level for a hypothesis test?

– the importance of the decision!

14. Define a Type I error

reject Ho when Ho is true

15. Define a Type II error

fail to reject Ho when Ho is false

16. Define power

reject Ho when Ho is false